



**PREVENTION OF WHITE SPOT LESION IN ORTHODONTIC PATIENTS USING  
CASEIN PHOSHOPEPTIDE-STABILIZED AMORPHOUS CALCIUM  
PHOSPHATE -A SYSTEMATIC REVIEW**

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**ABSRTACT**

Early demineralization around orthodontic brackets causes white or brown marks during fixed orthodontic treatment. There is an increased risk of accumulation of dental plaque associated with increased risk of rapid demineralization of the enamel of teeth. However , demineralization is an early, but reversible, stage in the development of tooth. Therefore, remineralising agents were used to treat white lesions in postorthodontic patients. Review question was Prevention of white sot lesions using CPP-ACP . :An electronic search was done in Pubmed, Cochrane and Science Direct. One randomized control trial was identified for the reiew. It is seen that more evidence is required before the application of CPP-ACP to prevent white spot lesions in orthodontic patients.

**KEY WORDS:** CPP-ACP, Prevention of white spot lesions, Orthodontic patients

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## INTRODUCTION

White spot lesions are defined as subsurface enamel porosities caused due to imbalance between demineralization and remineralization<sup>1</sup>. The demineralization of enamel adjacent to orthodontic brackets has shown a significant increase in the prevalence and severity after orthodontic treatment when compared with untreated individuals. The prevalence of white spot lesions in orthodontic patients is seen between 2%–96%. These decalcified lesions may subsequently require restorative treatment<sup>2-4</sup>. It is essential to enhance the natural remineralization by saliva. Products containing bioavailable calcium and phosphate has been introduced by Reynolds et al as casein phosphopeptide-stabilized amorphous calcium phosphate [CPP-ACP].<sup>5</sup> The remineralization of enamel subsurface lesions by CPP-ACP complexes has been demonstrated in various laboratory, animal, and human in situ experimental studies<sup>5-10</sup>. The objective of this review was to evaluate the effects of CPP-ACP in reducing the incidence of white lesions on the teeth during orthodontic treatment. The following databases were searched: PubMed Central, Cochrane Database of Systematic Reviews, Science Direct upto July 2014. Bibliographies of clinical studies identified in the electronic search were analyzed for studies published outside the electronically searched journals. The search term combination for electronic databases was as follows: MeSH headings, text words and word variants for “Orthodontic patients” and “remineralisation” and “demineralisation” and white spot lesions and prevention were combined using Boolean operator.

### ***Inclusion criteria***

Clinical studies evaluating the preventive effect of CPP-ACP on white spot lesions around orthodontic brackets.

### ***Exclusion Criteria***

Articles other than in English  
Invitro studies  
Studies involving other than CPP-ACP products as remineralising agents

### ***Screening and Study selection***

Two review authors [Deepa and Sujatha] independently assessed the titles and abstracts of studies obtained from the searches. Full text of those articles that met the inclusion criteria were assessed independently and any dispute regarding eligibility of an article was resolved by discussion. If consensus could not be reached by the two review authors, a third review author [Aravind Kumar] was consulted. Those studies that were included for the systematic review underwent quality assessment and data extraction.

### ***Data synthesis***

#### ***Data Extraction from selected studies***

Data were extracted independently in a preformed data extraction sheets by two review authors [DG and SS]. Information regarding the study characteristics of included studies such as author name and year, study design, follow up period, criteria used for remineralisation, population group were recorded independently by both the review authors. Quality assessment of the obtained studies was done according to the following criteria such as randomization sequence, allocation concealment, blind outcome assessment, completeness of follow up and handling of losses are considered as major criteria and outcome data, funding source considered to be minor criteria. If the study has not satisfied any one of major criteria, the study is considered as high risk of bias.<sup>11</sup>

## RESULTS

### ***Study Selection***

The systematic search from PubMed, Cochrane library and Science Direct, obtained a total of 37 citations. On reviewing the titles 2 articles were found to be applicable and one article potentially relevant after reviewing the abstract and its full paper was obtained. Only one article<sup>12</sup> met the inclusion criteria and was selected for the area of intended research.

Domain	Robertson et al 2011
<u>Selection bias.</u>	
Random sequence generation.	Yes
Allocation concealment.	Yes
<u>Performance bias.</u>	
Blinding of participants and personnel Assessments should be made for each main outcome [or class of outcomes].	Yes
<u>Detection bias.</u>	
Blinding of outcome assessment Assessments should be made for each main outcome [or class of outcomes].	Unclear
<u>Attrition bias.</u>	
Incomplete outcome data Assessments should be made for each main outcome [or class of outcomes].	Unclear
<u>Reporting bias.</u>	
Selective reporting.	Yes
<u>Other bias.</u>	
Other sources of bias.	Yes

## DISCUSSION

In-vitro<sup>7,13</sup> and in-situ studies<sup>14,15</sup> have shown that casein phosphopeptide amorphous calcium phosphate can promote the remineralization of subsurface enamel lesions. It has been seen that current clinical evidence is insufficient to prove a clinical benefit of casein phosphopeptide amorphous calcium phosphate in orthodontic patients. Only one study<sup>12</sup> was identified in the search which was adjudged to be at low risk of bias. The study fulfilled five criteria with low risk of bias and attrition bias and detection bias had unclear explanations. The study had reported attrition in each subgroup but there were no reasons stated for dropouts. The detection bias was also not completely ruled out because the authors have stated that photographs were evaluated but the lining of the evaluator was not clearly reported. The enamel decalcification index was also used to determine the number of white spot lesions. Visual assessment by clinical or photographic examination is the most relevant approach for the assessment of White Spot Lesions [WSL]. Clinical index systems or visual assessment are used to quantify the severity of WSLs, although small changes in white spot lesions are detected by this system<sup>16, 17</sup>. Taking a clinical photography, will help obtain consensus between raters, which in turn permits quantification of the lesions<sup>18</sup>. Photographs with consistent lighting have to be taken to avoid reflections which can mask or mimic WSLs.

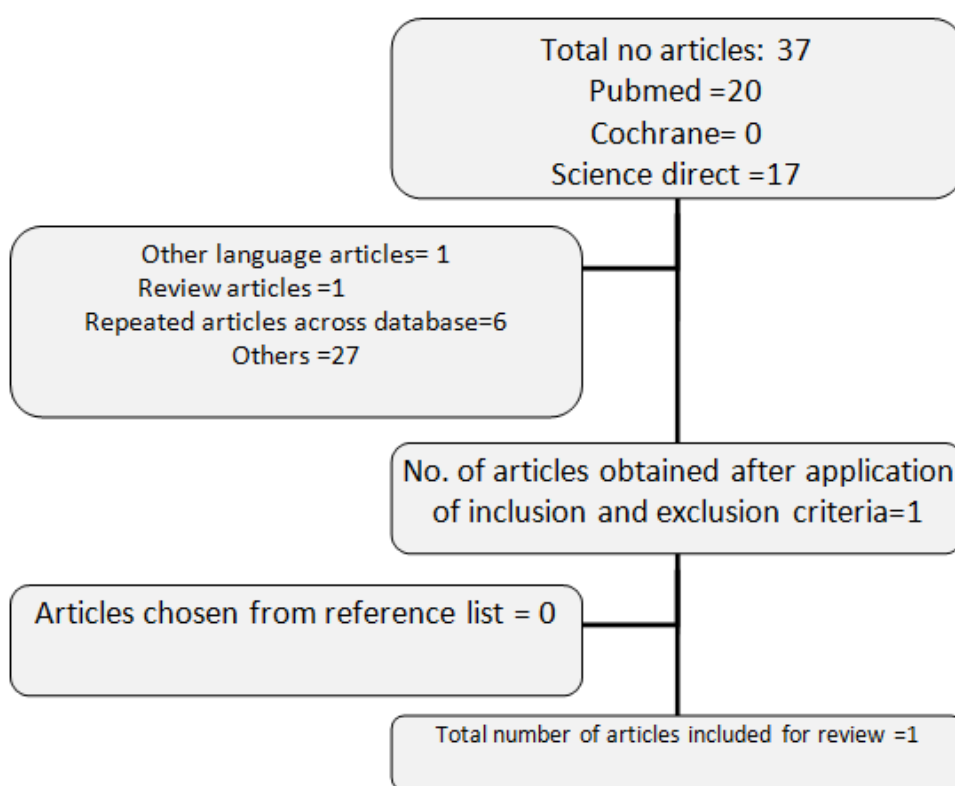
Since Robertson et al had used both clinical and photographic examination in the study, the flaws regarding assessment could have been minimized. Though Quantitative light-induced fluorescence and DIAGNOdent have proven to be sensitive techniques that can also be used to quantitatively assess WSLs, it is also essential to have a clinical evaluation.<sup>19</sup> Quantitative light-induced fluorescence has the advantage of a closer correlation with changes in enamel structure and mineral content<sup>19,20</sup>. DIAGNOdent readings can also be affected by stains, calculus, and plaque<sup>21</sup> and are based on bacterial metabolites,<sup>22</sup> which are not directly related to the problems perceived by patients or doctors. Combined use of both technology-based methods and visual assessment could be the best approach in future studies. The enamel decalcification index was done by assessing the photographs in the statistical analysis section it is stated that three independent authors evaluated the photographs but in the discussion section it is stated that two authors obtained the scores for enamel decalcification index. The clinical examination was done using ICDAS, but the person who did the clinical examination, number of examiners and calibration of examiners was not mentioned. The method of sample size calculation and the power of the study were not mentioned. The authors themselves have concluded that more samples

would have given a statistically significant results and sample size was a drawback of the study. The authors have also mentioned patient compliance as a drawback and standardized method of application was not employed. The need for testing the method of application also arises. With the increase in people requiring orthodontic treatment,<sup>23</sup> it is the responsibility of the dentist to prevent white spot lesions during orthodontic treatment.

## CONCLUSION

It is seen that more evidence is required before the application of CPP-ACP to prevent white spot lesions in orthodontic patients. A randomized control trials which is adequately powered, double-blinded, with placebo control, allocation concealment and masking of outcome assessment, are needed.

**Figure 1**  
**Selection of articles**



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